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(54) **CONTROLLED SQUAT STRENGTH-TRAINING MACHINE**

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A63B 21/00	(2006.01)
A63B 21/04	(2006.01)
A63B 21/055	(2006.01)
A63B 21/002	(2006.01)

(52) **U.S. Cl.**

CPC ***A63B 23/04*** (2013.01); ***A63B 21/002*** (2013.01); ***A63B 21/0407*** (2013.01); ***A63B 21/0557*** (2013.01); ***A63B 21/154*** (2013.01); ***A63B 21/4015*** (2015.10); ***A63B 21/4035*** (2015.10); ***A63B 21/4039*** (2015.10); *A63B 2023/0411* (2013.01); *A63B 2230/01* (2013.01)

(58) **Field of Classification Search**

CPC A63B 23/04; A63B 21/002; A63B 21/0407; A63B 21/0557; A63B 21/154; A63B 21/4015; A63B 21/4035; A63B 21/4039; A63B 2023/0411; A63B 2230/01

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,637,063	A *	6/1997	Fuller, Sr.	A63B 69/34 482/137
7,029,426	B1 *	4/2006	Fuller, Sr.	A63B 21/4047 482/137
7,470,221	B1 *	12/2008	Ramos	A63B 21/4035 482/904
8,147,389	B1 *	4/2012	Hoole	A63B 23/1227 482/37
10,220,233	B2 *	3/2019	Schmidt	A63B 21/00065
10,792,532	B1 *	10/2020	Hall	A63B 21/062
11,235,194	B2 *	2/2022	Parker	A63B 21/4009
2007/0197353	A1 *	8/2007	Hundley	A63B 21/4047 482/93
2017/0203149	A1 *	7/2017	D'Amico	A63B 21/0615
2020/0038704	A1 *	2/2020	Adams	A63B 21/4009
2020/0094099	A1 *	3/2020	Kelly	A63B 21/0609

* cited by examiner

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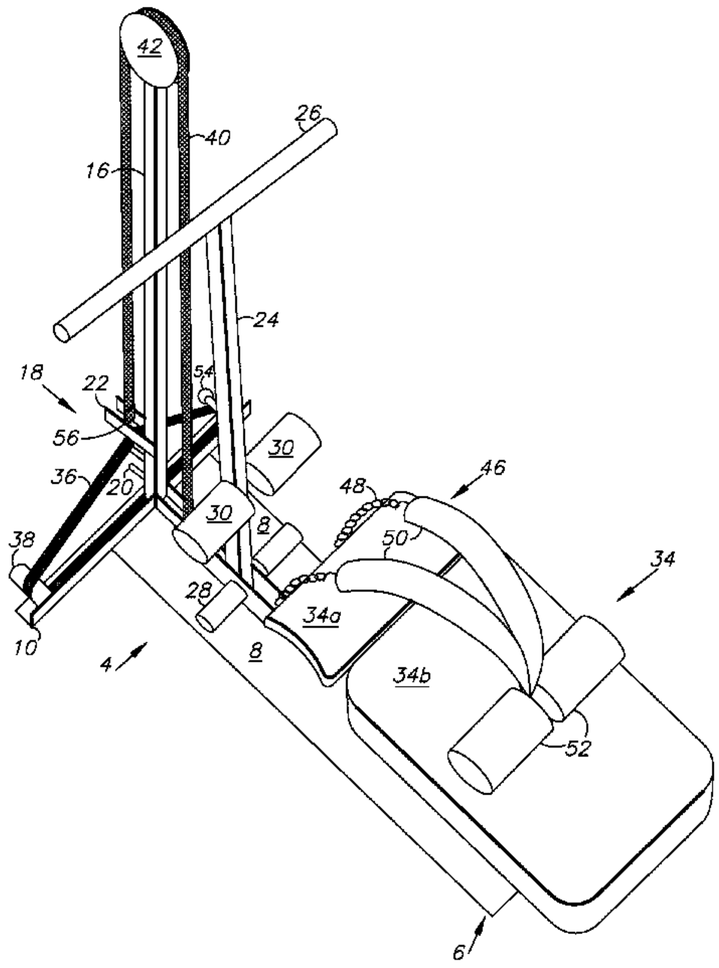
(57) **ABSTRACT**

A controlled squat strength-training machine includes a frame with a base mounting forward, intermediate, and rear uprights. The intermediate upright is pivotally connected to the base and is configured for limited rotation fore-and-aft. Knee pads are provided for restraining of users' knees. Users can adjust the resistance of the machine and thereby very the exercises performed thereon.

14 Claims, 4 Drawing Sheets



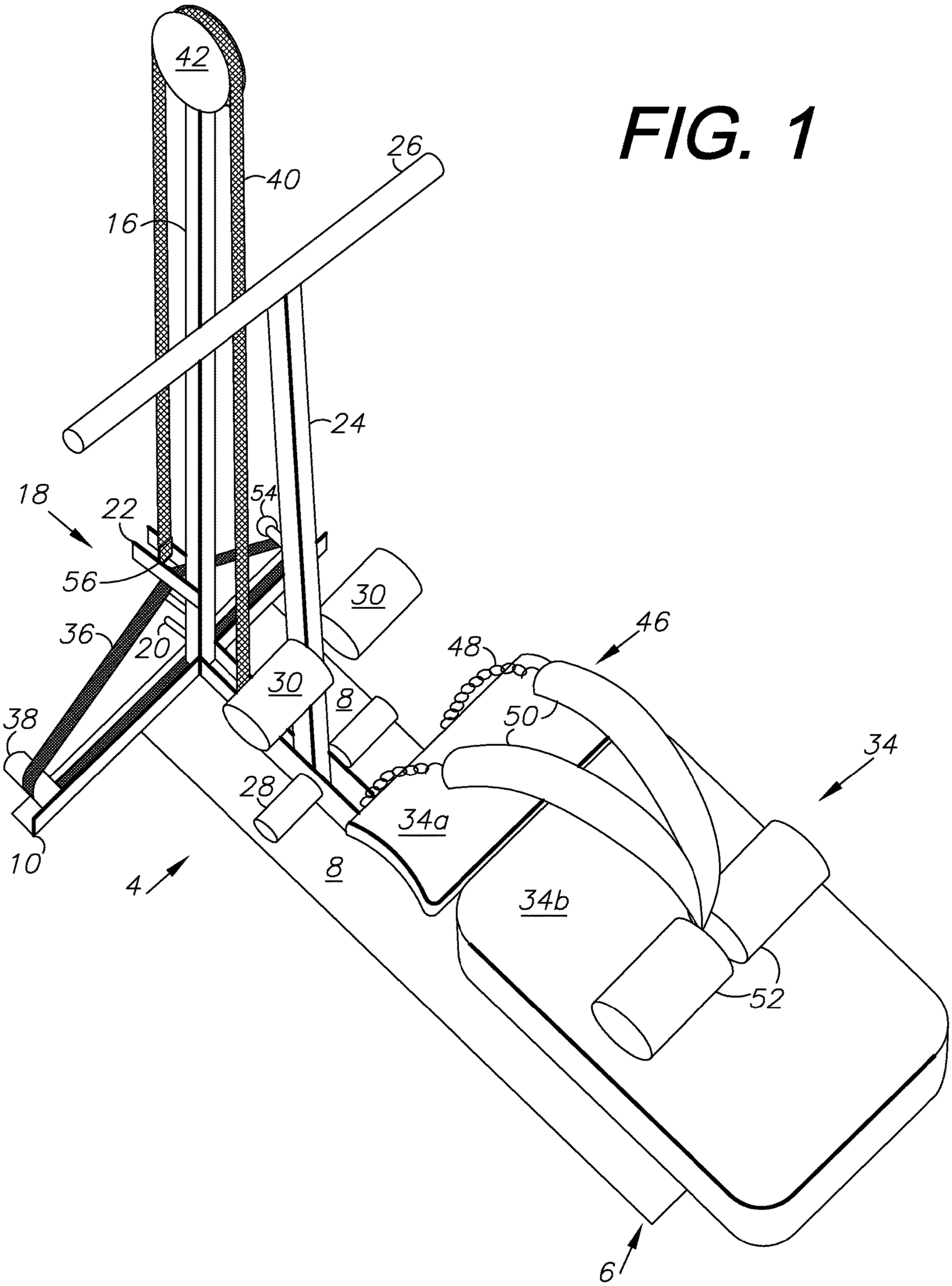

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FIG. 1

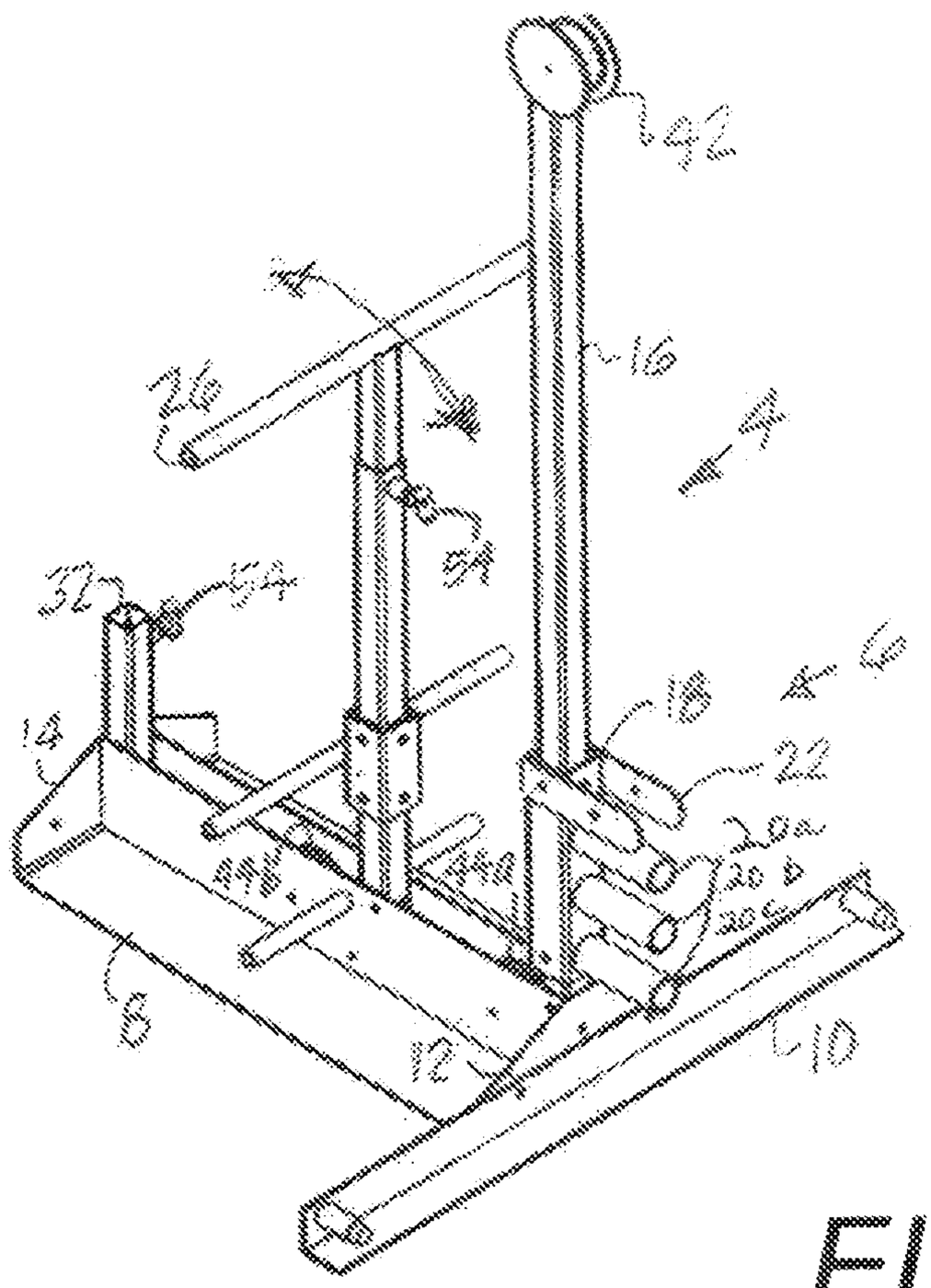

FIG. 2

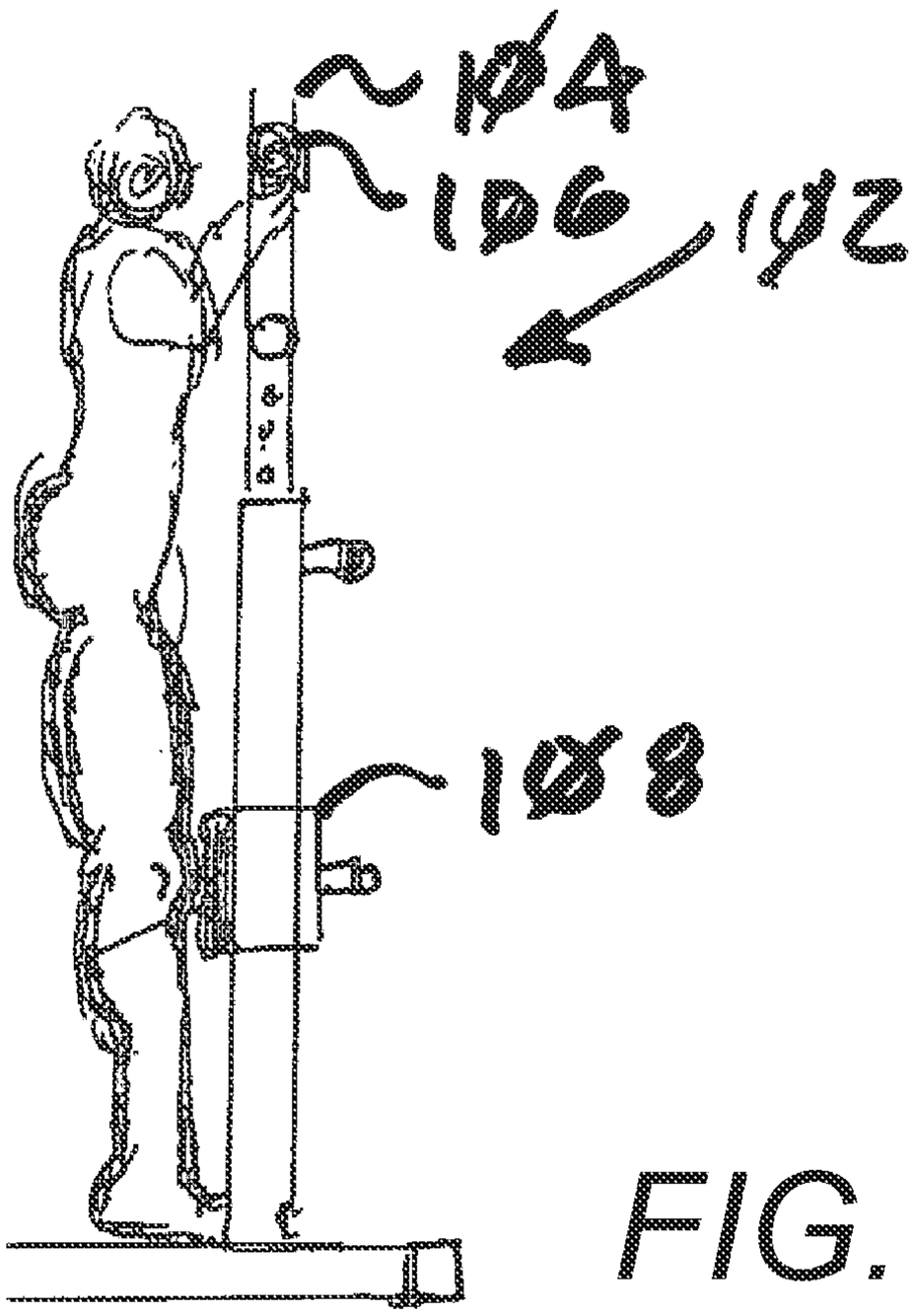

FIG. 3

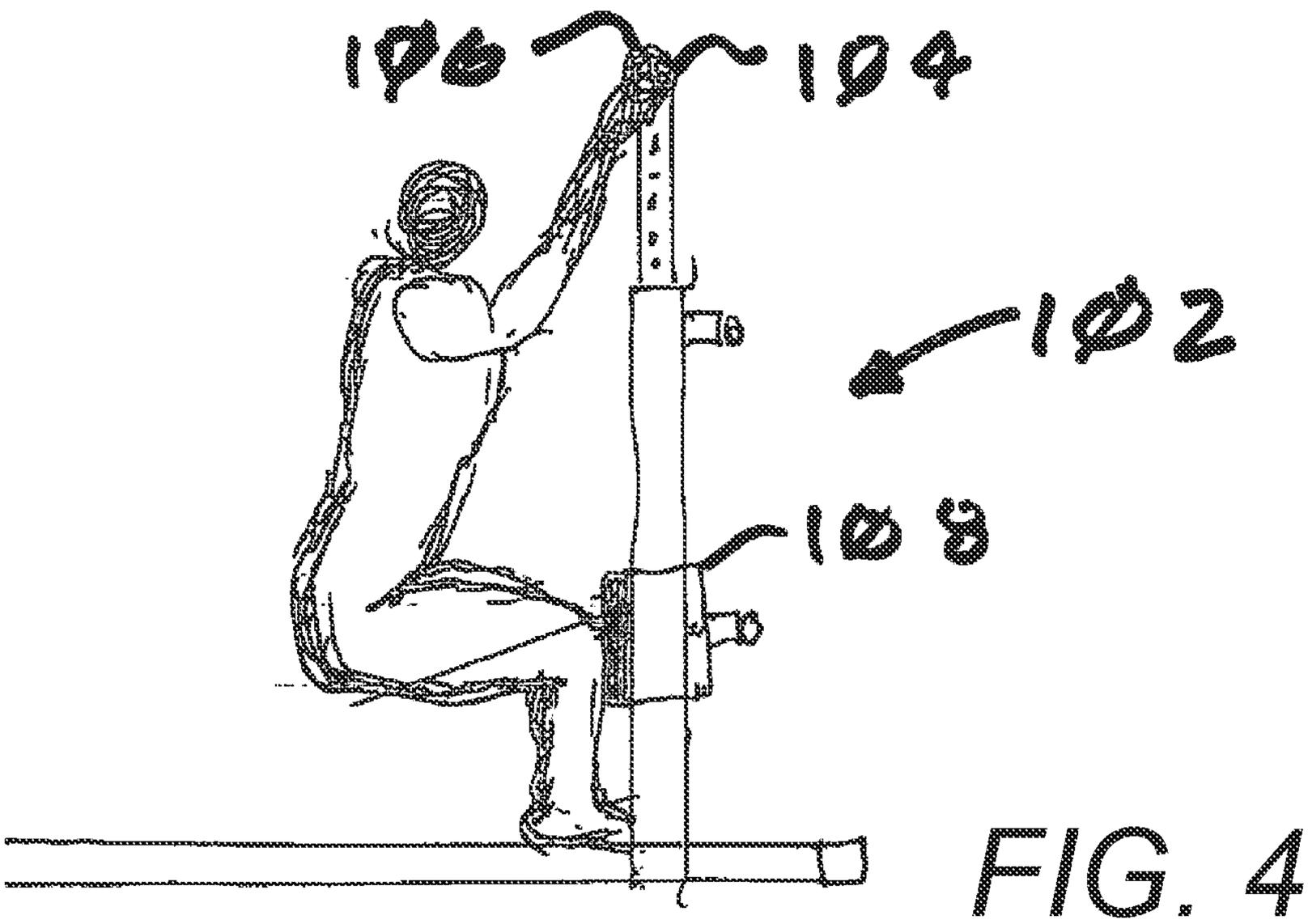

FIG. 4

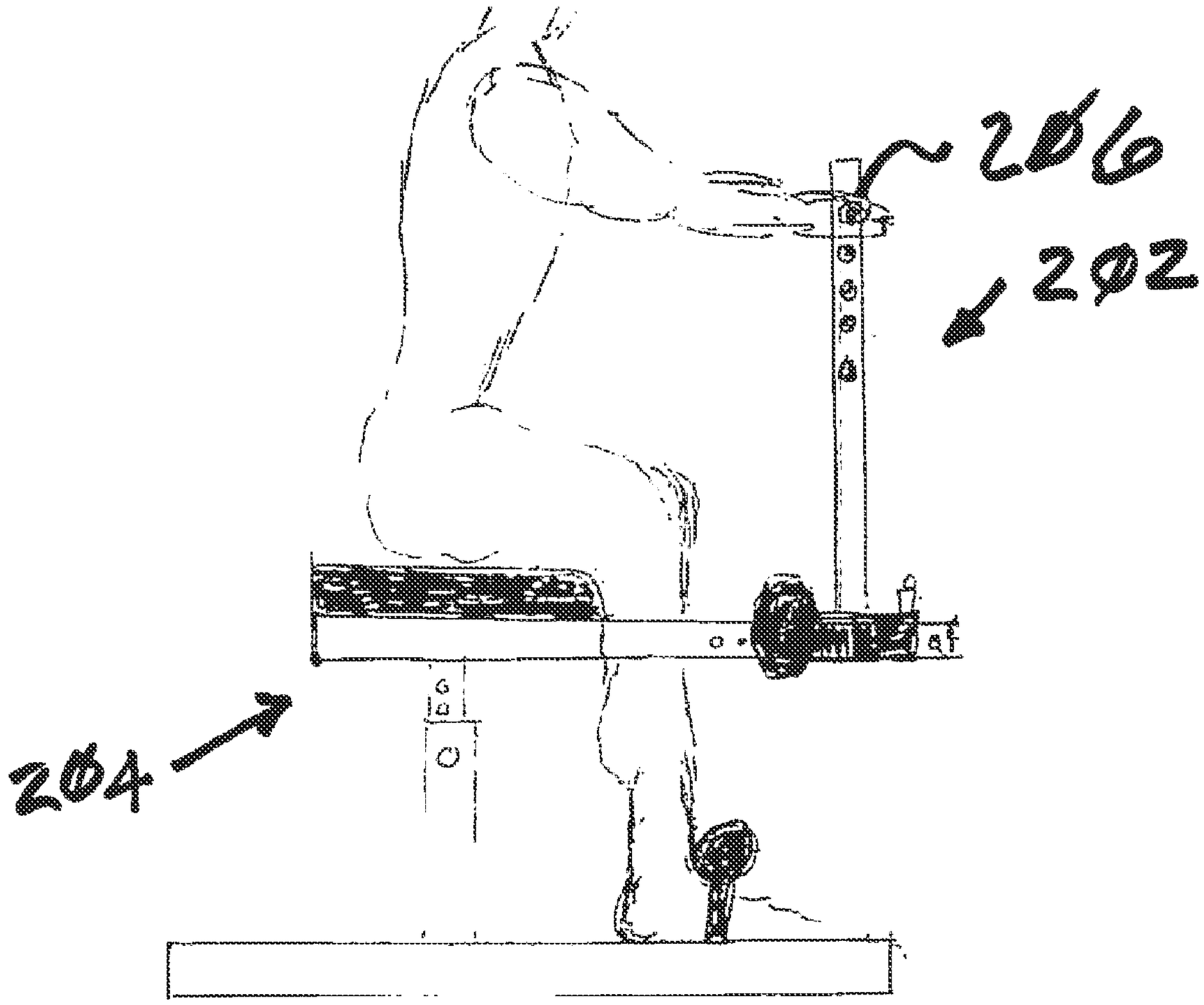

FIG. 5

CONTROLLED SQUAT STRENGTH-TRAINING MACHINE

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority in U.S. Provisional Patent Application No. 63/273,004, filed Oct. 28, 2021, which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to exercise equipment, and in particular to a strength-training machine for performing squats with variable resistance through a controlled range-of-movement (ROM) for dynamic positioning.

2. Description of the Related Art

Physical training (PT) exercises can be performed with free weights, such as barbells, dumbbells, etc. Moreover, individuals can strength-train using their own body weight in exercises such as push-ups, pull-ups, etc. Exercise machines are available for performing various resistance training exercises within controlled ranges-of-movement (ROMs) with adjustable resistance. However, previously, there has not been available a squat strength-training machine with the advantages and features of the present invention, including stabilizing a user's knee joints throughout the squat (ROM) exercise.

Squat exercises are performed by individuals raising and lowering themselves between standing and squatting positions. Squats strengthen several muscle groups, including quadriceps in the legs and erectors in the back. Greater strength can be achieved by performing squats with free weights, such as barbells resting on the shoulders and by participants holding dumbbells. By using free weights, the strength-training benefits are increased. However, participants using unrestrained free weights are susceptible to injuries, particularly to the knees. Risks of injuring or "blowing out" knees increase as individuals perform squats with greater weights. Such injuries can range from minor strains of the muscles and ligaments to tears and separations. Extensive injuries can necessitate medical treatment and, in severe cases, surgical repair of damaged muscles and ligaments.

Heavy lifts, including squats, are often done in the presence of another individual, i.e., a "spotter." Spotters can catch a barbell in the event an individual is unable to complete the exercise due to excessive weight, fatigue, muscle cramping, etc. Alternatively, squat cages and similar equipment are available for controlling ranges of movement and reducing injury risks to users.

Resistance training equipment using springs and elasticized bands as resistance elements are also available. Variable resistance can be achieved by using springs and bands with different expansion-contraction characteristics, and by using multiple resistance elements.

Previously, there has not been available a dynamic-positioning, knee-stabilizing, motion-limiting, squat-training machine with the advantages and features of the present invention.

SUMMARY OF THE INVENTION

The present invention includes a frame configured for placement on a flat surface. The individual participant starts

in a sitting position and rises to a standing position while gripping a T-bar to perform a squat. One or more elasticized resistance bands stretch through the range of motion. The machine includes pads configured for supporting an individual and restraining him or her throughout the squat motion. The resistance bands, pads and other frame elements are adjustable for repositioning as necessary to optimize the exercise benefit.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings constitute a part of this specification and include exemplary embodiments of the present invention illustrating various objects and features thereof.

FIG. **1** is a partial, perspective view of a front portion of a controlled squat strength-training machine embodying an aspect or embodiment of the present invention.

FIG. **2** shows portions of the machine, including: the base frame; the vertical standard with a vertically-sliding traveler, an upper band pulley; a T-bar assembly; and a rear upright for vertically-adjustably mounting a bench.

FIG. **3** is a side elevation, showing an alternative embodiment of the present invention with a user in an upright, standing position with his or her knees engaging a knee pad.

FIG. **4** is another side elevation, showing a user in a squatting position with his or her knees engaging the knee pad.

FIG. **5** is a side elevation of another alternative embodiment of the present invention with a user in a seated position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

I. Introduction and Environment

As required, detailed aspects of the present invention are disclosed herein, however, it is to be understood that the disclosed aspects are merely exemplary of the invention, which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art how to variously employ the present invention in virtually any appropriately detailed structure.

Certain terminology will be used in the following description for convenience in reference only and will not be limiting. For example, up, down, front, back, right, and left refer to the invention as orientated in the view being referred to. The words "inwardly" and "outwardly" refer to directions toward and away from, respectively, the geometric center of the aspect being described and designated parts thereof. Said terminology will include the words specifically mentioned, derivatives thereof and words of similar meaning.

II. Controlled Squat Strength-Training Machine **2**

Referring to the drawings more detail, FIGS. **1-2** show an embodiment or aspect of the present invention comprising a controlled squat strength-training machine, which is generally designated by the reference numeral **2**. The machine **2** includes a frame **4** with a base **6**, including a pair of longitudinal angle sections **8** and a front, transverse angle section **10**. The frame **4** also includes front and back gussets **12**, **14**.

A front upright **16** is attached to the front gussets **12** and the front ends of the longitudinal angle sections **8**. The front

upright mounts a traveler **18**, which is vertically slidably movable thereon and includes multiple (e.g., **3** are shown) upper, intermediate, and lower rods **20***a*, **20***b*, **20***c* respectively, which extend forwardly from the traveler **18**. A pair of forwardly-extending traveler arms **22** are positioned above the rods **20***a*, **20***b* and **20***c*.

An intermediate upright **24** is pivotally connected to the longitudinal angle sections **8** and telescopically, vertically-adjustably mounts a generally horizontal grip bar **26**. The intermediate upright **24** also mounts a pair of knee pads or restraints **30**.

A pair of padded foot restraints **28** are connected to the longitudinal angle sections **8** and are configured for engagement by a user to facilitate proper foot position and alignment. A rear upright **32** is connected to the longitudinal angle sections **8** and the rear gusset **14**. The rear upright **32** adjustably mounts a seat assembly **34** comprising a front, knee-engaging component **34***a* and a rear seat component **34***b*.

An elastomeric resistance band **36** is attached to the transverse angle section **10** by a pair of forwardly-extending resistance band anchors **38**. A lifting strap **40** is anchored at **56** to the traveler arms **22**, passes over an upper pulley **42**, passes under front and back lower pulleys **44***a*, **44***b* respectively and terminates at a yoke assembly **46**. The yoke assembly **46** includes a chain **48**, which mounts a padded yoke **50** configured for placement over a user's shoulders and supporting a pair of pads **52** for placement on a user's neck. The knee pads or restraints **30** engage the user's legs, preferably in proximity to the knees.

The components of the strength-training machine are adjustable to accommodate various users through squat exercises with different ranges-of-motion. For example, telescoping tubes can be secured in place by locking pins **54**. Moreover, multiple resistance bands **36**, with different resistance characteristics, can be utilized for increasing or decreasing lifting resistance. The resistance band **36** offers greater resistance when placed over the uppermost rod **20***a* and the least resistance when placed over the lowermost rod **20***c*. The yoke assembly connecting chain **48** enables adjustment to accommodate users of different heights.

III. Alternative Embodiments

FIGS. **3-4** show a controlled squat strength-training machine comprising a first alternative aspect or embodiment of the present invention with a modified upright **104**, grip bar assembly **106** and knee pad assembly **108**. The strength-training machine **102** enables strength-training squats using the bodyweight of the user. The user's body weight can be supplemented with weights, e.g., a weight vest.

FIG. **5** shows a controlled squat strength-training machine comprising a second alternative aspect or embodiment of the present invention with a modified seat assembly **204**. The user can pull himself or herself up by grasping a grip bar assembly **206**.

IV. Conclusion

It is to be understood that the invention can be embodied in various forms and is not to be limited to the examples specifically discussed above. The range of components and configurations which can be utilized in the practice of the present invention is virtually unlimited.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A controlled squat strength-training machine comprising:

a frame including a base configured for placement on a support surface;

a first upright with a lower end fixedly connected to said base, said first upright extending upwardly from said base and terminating at a first upright upper end;

a second upright with an intermediate upright lower end pivotally connected to the base, said second upright extending upwardly from said base and terminating at an second upright upper end, said second upright configured for pivotal movement fore-and-aft relative to the base;

a third upright fixedly connected to said base and extending upwardly therefrom, said third upright terminating at a third upright upper end;

a traveler assembly vertically-slidably mounted on said first upright;

an upper pulley mounted on said first upright upper end;

a resistance band connected to said base and said traveler, said resistance band configured for stretching when the traveler moves upwardly on said first upright;

a grip bar mounted on said second upright upper end and configured for grasping by a user;

a knee pad assembly mounted on said second upright and configured for engagement by a user in proximity to the user's knees;

front and back lower pulleys rotatably mounted on said base;

a strap connected to said traveler, extending over said upper pulley, extending below said lower pulleys and terminating at a strap rear end;

a yoke assembly including: a chain connected to said strap rear end; and a yoke connected to the chain and configured for engaging a user behind his or her neck;

a seat assembly mounted on said third upright upper end; and

said machine configured for restraining a user's knees during a squat exercise starting with the user seated on the seat assembly with his or her knees engaging the knee pad assembly, the user stretching the resistance band through the standing portion of a squat exercise while his or her knees remain engaged with the knee pad assembly.

2. The strength-training machine according to claim **1**, wherein said frame includes:

a pair of longitudinal angle sections with front and rear ends, said longitudinal angle sections positioned in generally horizontal, parallel, spaced relation;

said first, second and third uprights comprising front, intermediate, and rear uprights mounted at their respective lower ends to said longitudinal angle sections, with said upright lower ends located between said longitudinal angle sections;

a front transverse section attached to said longitudinal angle sections at their front ends; and

a rear transverse section attached to said longitudinal angle sections at their rear ends.

3. The strength-training machine, according to claim **2**, which includes:

a pivot bolt extending through said longitudinal angle sections and said intermediate upright lower end; and

said frame configured for restricting fore-and-aft pivotal movement of said intermediate upright.

4. The strength-training machine, according to claim 3, which includes:

a pair of foot restraints mounted on said longitudinal angle sections and configured for engagement with a user's feet for restraining the user's legs.

5. The strength-training machine, according to claim 4, which includes:

said traveler assembly having multiple rods extending forwardly therefrom and configured for adjusting a vertical lifting resistance of said traveler assembly.

6. The strength-training machine according to claim 1, which includes:

said traveler assembly including a pair of forwardly-extending arms; and

a lifting strap anchor extending between said traveler assembly arms and configured for anchoring a front end of said lifting strap.

7. The strength-training machine, according to claim 2, wherein said frame includes a pair of resistance band anchors each mounted on a respective end of said front transverse section and configured for removable connection to a respective resistance band end.

8. The strength-training machine, according to claim 1, wherein said seat assembly comprises a front seat section configured for engaging a user's knees and a rear seat section configured for supporting said user in a sitting position at the beginning of a lift exercise.

9. The strength-training machine, according to claim 1, wherein said yoke assembly includes a pad configured for engaging a user's neck.

10. A controlled squat strength-training machine comprising:

a frame including a base configured for placement on a support surface;

a front upright with a lower end fixedly connected to said base, said front upright extending upwardly from said base and terminating at a front upright upper end;

an intermediate upright with an intermediate upright lower end pivotally connected to the base, said intermediate upright extending upwardly from said base and terminating at an intermediate upright upper end, said intermediate upright configured for pivotal movement fore-and-aft relative to the base;

a rear upright fixedly connected to said base and extending upwardly therefrom, said rear upright terminating at a rear upright upper end;

a traveler assembly vertically-slidably mounted on said front upright;

an upper pulley mounted on said front upright upper end;

a resistance band connected to said base and said traveler, said resistance band configured for stretching when the traveler moves upwardly on said front upright;

a grip bar mounted on said intermediate upright upper end and configured for grasping by a user;

a knee pad assembly mounted on said intermediate upright and configured for engagement by a user in proximity to the user's knees;

front and back lower pulleys rotatably mounted on said base;

a strap connected to said traveler, extending over said upper pulley, extending below said lower pulleys and terminating at a strap rear end;

a yoke assembly including: a chain connected to said strap rear end; and a yoke connected to the chain and configured for engaging a user behind his or her neck;

a seat assembly mounted on said rear upright upper end;

said machine configured for restraining a user's knees during a squat exercise starting with the user seated on the seat assembly with his or her knees engaging the knee pad assembly, the user stretching the resistance band through the standing portion of a squat exercise while his or her knees remain engaged with the knee pad assembly;

said frame including a pair of longitudinal angle sections with front and rear ends, said longitudinal angle sections positioned in generally horizontal, parallel, spaced relation;

said front, intermediate, and rear uprights mounted at their respective lower ends to said longitudinal angle sections, with said upright lower ends located between said longitudinal angle sections;

a front transverse section attached to said longitudinal angle sections at their front ends;

a rear transverse section attached to said longitudinal angle sections at their rear ends;

a pivot bolt extending through said longitudinal angle sections and said intermediate upright lower end;

said frame configured for restricting fore-and-aft pivotal movement of said intermediate upright;

a pair of foot restraints mounted on said longitudinal angle sections and configured for engagement with a user's feet for restraining the user's legs;

said traveler assembly having multiple rods extending forwardly therefrom and configured for adjusting a vertical lifting resistance of said traveler assembly;

said traveler assembly including a pair of forwardly-extending arms; and

a lifting strap anchor extending between said traveler assembly arms and configured for anchoring a front end of said lifting strap.

11. The strength-training machine, according to claim 10, wherein said frame includes a pair of resistance band anchors each mounted on a respective end of said front transverse section and configured for removable connection to a respective resistance band end.

12. The strength-training machine, according to claim 10, wherein said seat assembly comprises a front seat section configured for engaging a user's knees and a rear seat section configured for supporting said user in a sitting position at the beginning of a lift exercise.

13. The strength-training machine, according to claim 10, wherein said yoke assembly includes a pad configured for engaging a user's neck.

14. A controlled squat strength-training method comprising the steps of:

providing a frame including a base configured for placement on a support surface;

providing a front upright with a lower end fixedly connected to said base, said front upright extending upwardly from said base and terminating at a front upright upper end;

providing an intermediate upright with an intermediate upright lower end pivotally connected to the base, said intermediate upright extending upwardly from said base and terminating at an intermediate upright upper end, said intermediate upright configured for pivotal movement fore-and-aft relative to the base;

providing a rear upright fixedly connected to said base and extending upwardly therefrom, said rear upright terminating at a rear upright upper end;

providing a traveler assembly vertically-slidably mounted on said front upright;

providing an upper pulley mounted on said front upright upper end;

providing a resistance band connected to said base and said traveler, said resistance band configured for stretching when the traveler moves upwardly on said front upright;

providing a grip bar mounted on said intermediate upright upper end and configured for grasping by a user;

providing a knee pad assembly mounted on said intermediate upright and configured for engagement by a user in proximity to the user's knees;

providing front and back lower pulleys rotatably mounted on said base;

providing a strap connected to said traveler, extending over said upper pulley, extending below said lower pulleys and terminating at a strap rear end;

providing a yoke assembly including: a chain connected to said strap rear end; and a yoke connected to the chain and configured for engaging a user behind his or her neck;

providing a seat assembly mounted on said rear upright upper end; and

configuring said machine for restraining a user's knees during a squat exercise starting with the user seated on the seat assembly with his or her knees engaging the knee pad assembly, the user stretching the resistance band through the standing portion of a squat exercise while his or her knees remain engaged with the knee pad assembly.

* * * * *